

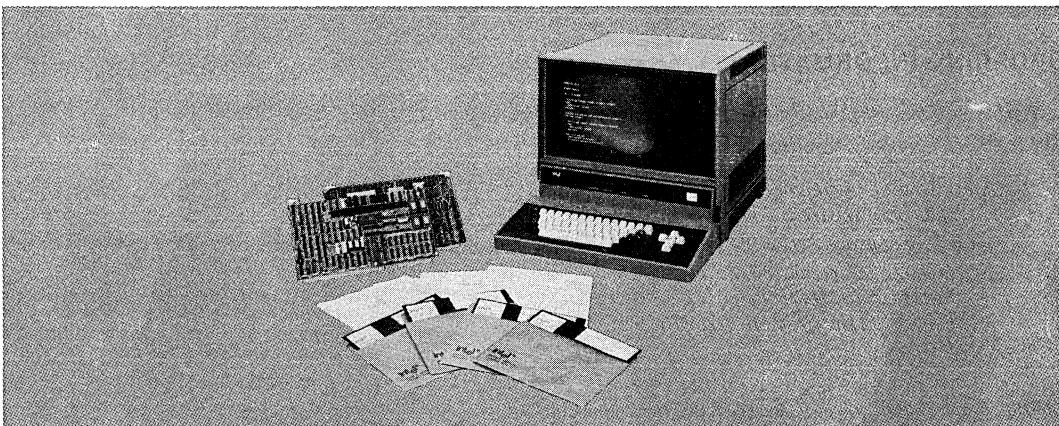


MODEL 286 INTELLEC® SERIES III MICROCOMPUTER DEVELOPMENT SYSTEM

- Supports Intellec 432/100 Evaluation and Educational System
- Compatible with iSBC-090 Series 90 Memory System Upgrade: 512K Byte to 1M Byte
- Complete 16-bit High Performance, Microcomputer Development Solution for Intel iAPX 86,88 Applications. Also Supports MCS-85™, MCS-80 and MCS-48 Families
- Supports Full Range of iAPX 86,88-Resident, High-Level Languages: PL/M 86/88, PASCAL 86/88, and FORTRAN 86/88
- 2 Host CPUs—iAPX 86 and 8085A—for Enhanced System Performance and Two Native Execution Environments
- 96K Bytes of User Program RAM Memory Available for iAPX 86,88 Programs
- Series II/80 and Series II/85 Upgradeable to 8085/iAPX 86 Series III Functionality
- Intellec Model 800 Upgradeable to 8080/iAPX 86 Series III Functionality
- Compatible with Intellec Distributed Development Systems
- Compatible with Previous Intellec Systems
- Software Applications Debugger for User iAPX 86,88 Programs
- Upgradeable to a Complete Ethernet* Communications Development System Environment, Using the Model 677 Upgrade

The Intellec Series-III Microcomputer Development System is a high-performance system solution designed specifically for iAPX 86,88 microprocessor development. It contains two host CPUs, an iAPX 86 and an 8085, that provide two native execution environments for optimum performance and compatibility with the Intellec software packages for both CPUs. The basic system includes 96K bytes of iAPX 86,88 user RAM memory and a 250K byte floppy disk drive. The powerful Disk Operating System maximizes system processing by utilizing the power of both host processors. Standard software includes a full range of iAPX 86,88 resident software. The high-level languages PL/M 86/88, PASCAL 86/88, and FORTRAN 86/88 are also available. A ROM resident software debugger not only provides self-test diagnostic capability, but also gives the user a powerful iAPX 86,88 applications debugger.

*Ethernet is a trademark of Xerox Corporation.



The following are trademarks of Intel Corporation and its affiliates and may be used only to identify Intel products: i, Intel, INTEL, INTELLEC, MCS, m, iCS, ICE, UPI, BXP, iSBC, iSBX, iSins, iRMX, System 2000, CREDIT, iRMX/80, MULTIBUS, PROMPT, Promware, Megachassis, Library Manager, MAIN MULTIMODULE, and the combination of MCS, ICE, iSBC, iRMX or iCS and a numerical suffix. © INTEL CORPORATION, 1981.

FUNCTIONAL DESCRIPTION

Hardware Components

The Intellec Series III is contained in a single package consisting of a CRT chassis with a 6-slot card cage, power supply, fans, cables, single floppy disk drive, detachable upper/lower case full ASCII keyboard, and four printed circuit cards. A block diagram of the system is shown in Figure 1.

System Components

Two CPU cards reside on the Intellec MULTIBUS, each containing its own microprocessor, memory, I/O, interrupt and bus interface circuitry implemented with Intel's high technology LSI components. The integrated processor card (IPC-85), occupies the first slot in the cardcage. A second CPU card, the resident processor board (RPB-86) contains Intel's 16-bit HMOS microprocessor. These CPUs provide the dual processor environment.

A third CPU card performs all remaining I/O including interface to the CRT, integral floppy disk, and keyboard. This card, mounted on the rear panel, contains its own microprocessors, RAM and ROM memory, and I/O interface logic. Known as the I/O controller (IOC), this slave CPU card communicates with the IPC-85 over an 8-bit bidirectional data bus. A 64K byte RAM expansion memory board is also included.

Expansion

Two additional slots in the system cardcage are available for system expansion. The Intellec expansion chassis Model 201 is available to provide 4 additional expansion slots for either memory or I/O expansion.

THE INTELLEC DEVELOPMENT SYSTEM FOR ETHERNET (DS/E)

The Intellec Series III can be expanded to provide the user with the tools necessary to develop and test

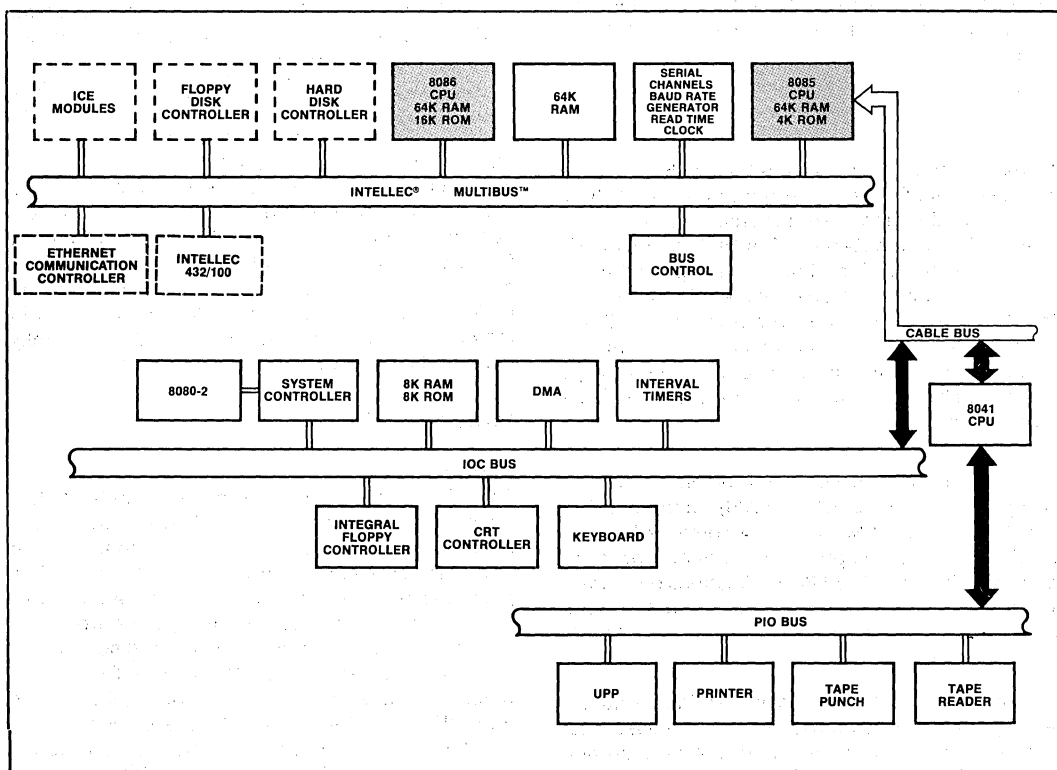


Figure 1. INTELLEC Series III Block Diagram

communications software and applications that will use Ethernet as a communications subsystem. The power of the Intellec Series III combined with Model 677 allows the user to develop either 8- or 16-bit Ethernet-based applications.

THE INTELLEC 432/100 EVALUATION AND EDUCATIONAL SYSTEM

The Intellec Series III provides a complete system environment necessary for evaluation of the Intel iAPX 432 32-bit micromainframe. The iSBC 432/100 board plugs into a Multibus slot in the Intellec Series III, sharing system memory and resources. A comprehensive set of documentation, system software and hardware provides the evaluation and educational environment for the powerful iAPX 432.

iAPX 286 Evaluation System

The Intellec Series III provides a complete system environment for evaluation of the iAPX 286 microprocessor's architecture and its instruction set, segmentation timing, memory mapping and protection features. A user can begin the development of complex iAPX 286 programs, systems and operating system nuclei with the Intellec Series III and iAPX 286 evaluation package.

CPU Cards

IPC-85

The heart of the IPC-85 is an Intel NMOS 8-bit microprocessor, the 8085A-2, running at 4.0 MHz. 64K bytes of RAM memory are provided on the board using 16K dynamic RAMs. 4K of ROM is provided, preprogrammed with system bootstrap "self-test" diagnostics and the Intellec System Monitor. The eight-level vectored priority interrupt system allows interrupts to be individually masked. Using Intel's versatile 8259A interrupt controller, the interrupt system may be user programmed to respond to individual needs.

RPB-86

The heart of the RPB-86 is an Intel HMOS 16-bit microprocessor, the iAPX 86 (8086), running at 5.0 MHz. 64K bytes of RAM memory are provided on the board. 16K of ROM is provided on board, preprogrammed with an iAPX 88/86 applications debugger which provides features necessary to debug and execute application software for the iAPX 88/86 microprocessors.

The 8085A-2 and iAPX 86 access two independent memory spaces. This allows the two processors to execute concurrently when an iAPX 88/86 program is run. In this mode, the IPC-85 becomes an intelligent I/O processor board to the RPB-86.

Input/Output

IPC-85 SERIAL CHANNELS

The I/O subsystem in the Series III consists of two parts: the IOC card and two serial channels on the IPC-85 itself. Each serial channel is independently configurable. Both are RS232-compatible and is capable of running asynchronously from 110 to 9600 baud or synchronously from 150 to 56K baud. Both may be connected to a user defined data set or terminal. One channel contains current loop adapters. Both channels are implemented using Intel's 8251A USART. They can be programmed to perform a variety of I/O functions. Baud rate selection is accomplished through an Intel 8253 interval timer. The 8253 also serves as a real-time clock for the entire system. I/O activity through each serial channel is independently signaled to the system through a second 8259A (slave) interrupt controller, operating in a polled mode nested to the master 8259A.

IOC INTERFACE

The remainder of the system I/O activity is handled by the IOC. The IOC provides the interface and control for the keyboard, CRT, integral floppy disk drive, and standard Intellec-compatible peripherals including printer, high speed paper tape reader/punch, and universal PROM programmer. The IOC contains its own independent microprocessor, an 8080A-2. This CPU issues commands, receives status, and controls all I/O operations as well as supervising communications with the IPC-85. The IOC contains interval timers, its own IOC bus system controller, and 8K bytes of ROM for all I/O control firmware. The 8K bytes of RAM are used for CRT screen refresh storage. Neither the ROM nor the RAM occupy space in the Intellec Series III main memory address range because the IOC is a totally independent microcomputer subsystem.

Integral CRT

DISPLAY

The CRT is a 12-inch raster scan type monitor with a 50/60 Hz vertical scan rate and 15.5 kHz horizontal scan rate. Controls are provided for brightness and contrast adjustments. The interface to the CRT is provided through an Intel 8275 single chip programmable CRT controller. The master processor on the IPC-85 transfers a character for display to the IOC, where it is stored in RAM. The CRT controller reads a line at a time into its line buffer through an Intel 8257 DMA Controller. It then feeds one character at a time to the character generator to produce the video signal. Timing for the CRT control is provided by an Intel 8253 programmable interval

timer. The screen display is formatted as 25 rows of 80 characters. The full set of ASCII characters are displayed, including lower case alphas.

KEYBOARD

The keyboard interfaces directly to the IOC processor via an 8-bit data bus. The keyboard contains an Intel UPI-41A Universal Peripheral Interface, which scans the keyboard and encodes the characters to provide N-key roll over. The keyboard itself is a typewriter style keyboard containing the full ASCII character set. An upper/lower case switch allows the system to be used for document preparation. Cursor control keys are also provided.

Peripheral Interface

A UPI-41A Universal Peripheral Interface on the IOC board provides built-in interface for standard Intellec-compatible peripherals including a printer, high speed paper tape reader, high speed paper tape punch, and universal PROM programmer. Communication between the IPC-85 and IOC is maintained over a separate 8-bit bidirectional data bus. Connectors for the four devices named above, as well as the two serial channels, are mounted directly on the IOC itself.

Control

User control is maintained through a front panel, consisting of a power switch and indicator, reset/boot switch, run/halt light and eight interrupt switches and LED indicators. The front panel circuit board is attached directly to the IPC-85, allowing the eight interrupt switches to connect the master 8259A, as well as to the Intellec Series III bus.

User program control in the iAPX 88/86 environment of the Intellec Series III is also directed through keyboard control sequences to transfer control to the iAPX 88/86 applications debugger, abort a user program or translator and returning control to the IPC-85.

DISK SYSTEM

Integral Floppy Disk Drive

The integral floppy disk is controlled by an Intel 8271 single chip, programmable floppy disk controller. The disk provides capacity of 250K bytes. It transfers data via an Intel 8257 DMA Controller between an IOC RAM buffer and the diskette. The 8271 handles reading and writing of data, formatting diskettes, and reading status, all upon appropriate commands from the IOC microprocessor.

Dual Drive Floppy Disk System (Option)

The Intellec Series III Double Density Diskette System provides direct access bulk storage, intelligent controller and two diskette drives. Each drive provides 1/2 million bytes of storage with a data transfer of 500,000 bits/second. The controller is implemented with Intel's powerful Series 3000 Bipolar Microcomputer Set and supports up to four diskette drives to allow more than 2 million bytes of on-line storage.

The diskette controller consists of two boards, the channel board and the interface board. These two PC boards reside in the Intellec Series III system chassis. The channel board receives, decodes and responds to channel commands from the 8085A-2 CPU on the IPC-85. The interface board provides the diskette controller with a means of communication with the disk drives and with the Intellec system bus. The interface board also validates data during disk transactions.

An additional cable and connectors are also supplied to optionally convert the integral floppy disk from single density to double density.

Hard Disk System (Option)

The Intellec Series III Hard Disk System provides direct access bulk storage, intelligent controller and a disk drive containing one fixed platter and one removable cartridge. Each provides approximately 3.65 million bytes of storage with a data transfer rate of 2.5 Mbits/second. The controller is implemented with Intel's Series 3000 Bipolar Microcomputer Set. The controller provides an interface to the Intellec Series III system bus, as well as supporting up to 2 disk drives. The disk system records all data in Double Frequency (FM) on 2 surfaces per platter. Each platter can be write protected by a front panel switch.

HARD DISK CONTROLLER BOARDS

The disk controller consists of two boards which reside in the Intellec Series III system chassis. The disk system is capable of performing six operations: recalibrate, seek, format track, write data, read data, and verify CRC. In addition to supporting a second drive, the disk controller may co-exist with the double-density diskette controller to allow up to 17 million bytes of on-line storage.

MULTIBUS Interface Capability

All models of the Intellec Series III implement the industry standard MULTIBUS protocol. The MULTIBUS architecture allows several bus masters, such as CPU and DMA devices, to share the bus and memory by operating at different priority levels. Resolution of bus exchanges is synchronized by a bus clock signal derived independently from processor clocks. Read/write transfers may take place at rates up to 5 MHz. The bus structure is suitable for use with any Intel microcomputer family.

System Software Features

The Model 286 offers many key advantages for iAPX 86,88 applications and Intellec Development Systems: enhanced system performance through a dual host CPU environment, a full spectrum of iAPX 86,88-resident high-level languages, expanded user program space for iAPX 86,88 programs, and a powerful high-level software applications debugger for iAPX 86,88 microprocessor software.

Dual Host CPU—The addition of a 16-bit 8086 to the existing 8-bit host CPU increases iAPX 86,88 compilation speeds and provides for iAPX 86,88 code execution. When the 8086 is executing a program, the 8-bit CPU off-loads all I/O activity and operates as an intelligent I/O controller to double buffer data to and from the 8086. The 8086 also provides an execution vehicle for 8086 and 8088 object code. An added benefit of two host microprocessors is that

8-bit translations and applications are handled by the 8-bit CPU, and 16-bit translations and applications are handled by the 8086. This feature provides complete compatibility for current systems and means that software running on current Intellec Development Systems will run on the new system.

High-Level Languages for iAPX 86,88—The Model 286 allows the current Intellec system user to take advantage of a breadth of new resident iAPX 86,88 high-level languages: PL/M 86/88, PASCAL 86/88, and FORTRAN 86/88. The iAPX 86,88 Resident Macro Assembler and these high-level language compilers execute on the 8086 host CPU, thereby increasing system performance.

Expanded Program Memory—By adding a Model 286 to an existing Intellec Development System, 96K bytes of user program RAM memory are made available for iAPX 86,88 programs. System memory is expandable by adding additional RAM memory modules. This, combined with the two host CPU system architecture, dramatically increases the processing power of the system.

Software Applications Debugger—The RPB-86 contains the applications debugger which allows iAPX 86,88 programs to be developed, tested, and debugged within the Intellec system. The debugger provides a subset of In-Circuit Emulator commands such as symbolic debugging, control structures and compound commands specifically oriented toward software debug needs.

SPECIFICATIONS

Host Processor Boards

INTEGRATED PROCESSOR CARD

- (IPC-85) 8085A-2 based, operating at 4 MHz
- 64K RAM, 4K ROM (2K in monitor and 2K in boot/diagnostic)

RESIDENT PROCESSOR BOARD

- (RPB-86) 8086 based, operating at 5 MHz, 64K RAM, 16K ROM (applications debugger)

BUS

- MULTIBUS bus, maximum transfer rate of 5 MHz

DIRECT MEMORY ACCESS

- (DMA) Standard capability on the MULTIBUS bus; implemented for user selected DMA devices through optional DMA module
- Maximum transfer rate of 2 MHz

Integral Floppy Disk

- Capacity—250K bytes (formatted)
- Transfer Rate—160K bits/sec
- Access Time—
 - Track to Track: 10 ms max.
 - Average Random Positioning: 260 ns
 - Rotational Speed: 360 rpm
 - Average Rotational Latency: 83 ms
 - Recording Mode: FM

Dual Floppy Disk Option

- Capacity—
 - Per Disk: 4.1 megabits (formatted)
 - Per Track: 53.2 kilobits (formatted)
- Transfer Rate—500 kilobits/sec
- Access Time—
 - Track to Track: 10 ms
 - Head Setting Time: 10 ms
 - Average Random Positioning Time—260 ms

Rotational Speed—360 rpm
Average Rotational Latency: 83 ms
Recording Mode: M² FM

Hard Disk Drive Option

Type—5440 top loading cartridge and one fixed platter
Tracks per Inch—200
Mechanical Sectors per Track—12
Recording Technique—double frequency (FM)
Tracks per Surface—400
Density—2,200 bits/inch
Bits per Track—62,500
Recording Surfaces per Platter—2
Capacity—
Per Surface—15M bits
Per Platter—29M bits
Per Drive—59M bits
Per Drive—7.3M bytes (formatted)
Transfer Rate—2.5M bits/sec
Access Time—
Track to Track: 13 ms max
Full Stroke: 100 ms
Rotational Speed: 2,400 rpm

Physical Characteristics

Width—17.37 in. (44.12 cm)
Height—15.81 in. (40.16 cm)
Depth—19.13 in. (48.59 cm)
Weight—81 lb. (37 kg)

KEYBOARD

Width—17.37 in. (44.12 cm)
Height—3.0 in. (7.6 cm)
Depth—9.0 in. (22.86 cm)
Weight—6 lb. (3 kg)

DUAL FLOPPY DRIVE SYSTEM (OPTION)

Width—16.88 in. (42.88 cm)
Height—12.08 in. (30.68 cm)
Depth—1.0 in. (48.26 cm)
Weight—64 lb. (29 kg)

HARD DISK DRIVE SYSTEM (OPTION)

Width—18.5 in. (47.0 cm)
Height—34.0 in. (86.4 cm)
Depth—29.75 in. (75.6 cm)
Weight—202 lb. (92 kg)

ELECTRICAL CHARACTERISTICS

DC Power Supply

Volts Supplied	Amps Supplied	Typical System Requirements
+ 5 ± 5%	30.0	17.0
+12 ± 5%	2.5	1.1
-12 ± 5%	0.3	0.1
-10 ± 5%	1.0	0.08
+15 ± 5%*	1.5	1.5
+24 ± 5%*	1.7	1.7

*Not available on bus

AC Requirements for Mainframe

110V, 60 Hz—5.9 Amp
220V, 50 Hz—3.0 Amp

ENVIRONMENTAL CHARACTERISTICS

System Operating Temperature—0° to 35°C
(32°F to 95°F)
Humidity—20% to 80%

DOCUMENTATION SUPPLIED

Intellec Series III Microcomputer Development System Product Overview, 121575

A Guide to Intellec Series III Microcomputer Development Systems, 121632-001

Intellec Series III Microcomputer Development System Console Operating Instructions, 121609

Intellec Series III Microcomputer Development System Pocket Reference, 121610

Intellec Series III Microcomputer Development System Programmer's Reference, 121618

iAPX 88/86 Family Utilities User's Guide for 8086-Based Development Systems, 121616

8086/8087/8088 Macro Assembly Language Reference Manual for 8086-Based Development Systems, 121627

8086/8087/8088 Macro Assembly Language Pocket Reference, 9800749

8086/8087/8088 Macro Assembler Operating Instructions for 8086-Based Development Systems, 121628

Intellec Series III Microcomputer Development System Installation and Checkout Manual, 121612

Intellec Series III Microcomputer Development System Schematic Drawings, 121642

ISIS-II CREDIT (CRT-Based Text Editor) User's Guide, 9800902

ISIS-II CREDIT (CRT-Based Text Editor) Pocket Reference, 9800903

The 8086 Family User's Manual, 9800722

The 8086 Family User's Manual, Numeric Supplement, 121586

For Series III Plus Hard Disk Systems Only:

Model 740 Hard Disk Subsystem Operation and Checkout, 9800943

ORDERING INFORMATION

Part Number Description

DS286 KIT Intellec Series III Model 286 Microcomputer Development System (110V/60Hz)

DS287 KIT Intellec Series III Model 287 Microcomputer Development System (220V/50Hz)

DS286FD KIT Intellec Series III Model 286 Microcomputer Development System with Dual Double Density Flexible Disk System (110V/60Hz)

DS287FD KIT Intellec Series III Model 287 Microcomputer Development System with Dual Double Density Flexible Disk System (220V/50Hz)

DS286HD KIT Intellec Series III Model 286 Microcomputer Development System with Pedestal Mounted Hard Disk. (110V/60Hz)

DS287HD KIT Intellec Series III Model 287 Microcomputer Development System with Pedestal Mounted Hard Disk. (220V/50Hz)

Requires Software License